Journal of Chemical Physics 2015 vol.142 N10

Scaling law for crystal nucleation time in glasses

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Abstract

© 2015 AIP Publishing LLC. Due to high viscosity, glassy systems evolve slowly to the ordered state. Results of molecular dynamics simulation reveal that the structural ordering in glasses becomes observable over "experimental" (finite) time-scale for the range of phase diagram with high values of pressure. We show that the structural ordering in glasses at such conditions is initiated through the nucleation mechanism, and the mechanism spreads to the states at extremely deep levels of supercooling. We find that the scaled values of the nucleation time, $\tau 1$ (average waiting time of the first nucleus with the critical size), in glassy systems as a function of the reduced temperature, T , are collapsed onto a single line reproducible by the power-law dependence. This scaling is supported by the simulation results for the model glassy systems for a wide range of temperatures as well as by the experimental data for the stoichiometric glasses at the temperatures near the glass transition.

http://dx.doi.org/10.1063/1.4914172